

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A catalytic composition for the (co)polymerization of ethylene and other α -olefins, comprising the following two components in contact with each other, or the product of their reaction:

- (i) a metallocene complex of a metal M of group 4 of the periodic table, including at least one η^5 -cyclopentadienyl group and at least one unsaturated hydrocarbyl group R', bonded to the metal M;
- (ii) an ionizing activator ~~consisting of~~ which is at least one organic or organometallic compound capable of reacting with said metallocene complex (i) so as to form a positive ionic charge thereon by the extraction of an anion of an unsaturated hydrocarbylic organic group and formation of a non-coordinating anion with a delocalized ionic charge;

~~characterized in that~~ wherein said unsaturated hydrocarbyl group R' has the following formula (I):



wherein:

- A represents any monomeric unit ~~deriving~~ derived from a vinylaromatic group polymerizable by means of anionic polymerization, having from 6 to 20 carbon atoms;
- D represents any monomeric unit ~~deriving~~ derived from a conjugated diolefin polymerizable by means of anionic polymerization, having from 4 to 20 carbon atoms;

- U represents any generic ~~optional~~ monomeric unit ~~deriving~~ derived from an unsaturated compound co-polymerizable with any of the above conjugated diolefins D or vinylaromatic compounds A;
- R¹ represents hydrogen or a hydrocarbyl group having from 1 to 20 carbon atoms;
- the index "x" can be zero or an integer;
- the index "y" is an integer higher than zero;
- the index "z" can be zero or an integer ranging from 1 to 20; and
- the sum (x+y) is equal to or higher than 2.

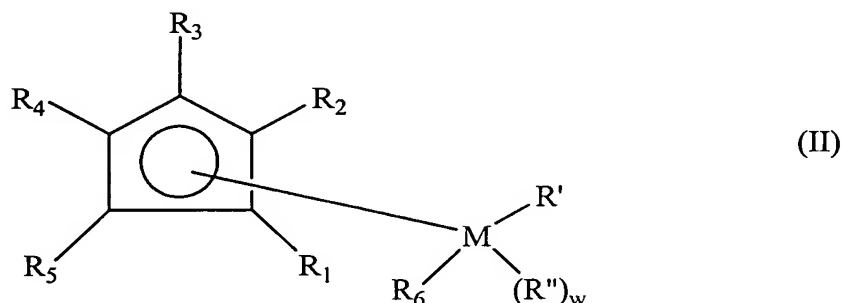
Claim 2 (Currently Amended): The catalytic composition according to claim 1, wherein said activating component (ii) is selected from the group consisting of compounds belonging to one of the following four types:

- I) oxygenated organometallic compounds of metals of groups 13 or 14 of the periodic table;
- II) non-coordinating ionic organometallic compounds;
- III) non-coordinating Lewis acids, and
- IV) polyfluorinated cyclopentadienyl compounds.

Claim 3 (Currently Amended): The catalytic composition according to ~~any of the claims 1 or 2~~ claim 1, wherein said component (ii) is selected from the compounds of types II), III) and IV).

Claim 4 (Currently Amended): The catalytic composition according to ~~any of the previous claims~~ claim 1, wherein said (x+y) sum is between 2 and 50.

Claim 5 (Currently Amended): The catalytic composition according to ~~any of the previous claims~~ claim 1, wherein said metallocene complex in component (i) is represented by the following formula (II):



wherein:

- M is a metal selected from the group consisting of titanium, zirconium and hafnium, ~~preferably from titanium and zirconium~~, coordinatively bonded to a first η^5 -cyclopentadienyl group;
- ~~— R' is an unsaturated hydrocarbyl group as previously defined in claim 1;~~
- R'' represents an ~~optional~~ organic or inorganic group bonded to the metal M, having an anionic nature, different from cyclopentadienyl or substituted cyclopentadienyl;
- the groups R₁, R₂, R₃, R₄, R₅, each independently, ~~represent~~ represents an atom or a radical bonded to said first η^5 -cyclopentadienyl group, selected from the group consisting of hydrogen, ~~or any other suitable organic groups and or inorganic substituent of said cyclopentadienyl group groups~~;
- R₆ represents ~~any other suitable~~ an organic or inorganic group of an anionic nature, bonded to the metal M;

- "w" has the value of 0 or 1, ~~according to whether the group R" is present or absent in formula (II).~~

Claim 6 (Currently Amended): The catalytic composition according to ~~any of the previous claims~~ claim 1, wherein said metal M is selected from the group consisting of titanium and zirconium.

Claim 7 (Currently Amended): The catalytic composition according to ~~any of the previous claims~~ claim 1, wherein said metal M is zirconium in oxidation state +4.

Claim 8 (Currently Amended): The catalytic composition according to ~~any of the previous claims~~ claim 1, wherein said monomeric units of the D type in formula (I) derive from 1,3-diolefins with 4 to 20 carbon atoms.

Claim 9 (Currently Amended): The catalytic composition according to claim 8, wherein said 1,3-diolefin is selected from the group consisting of 1,3-butadiene, isoprene, 1,3-pentadiene, 2-methyl-1,3-pentadiene, and 1,3-hexadiene.

Claim 10 (Currently Amended): The catalytic composition according to ~~any of the previous claims~~ claim 1, wherein said monomeric units of the A type in formula (I) derive from hydrocarbyl vinyl aromatic compounds having from 8 to 15 carbon atoms.

Claim 11 (Currently Amended): The catalytic composition according to claim 10, wherein said vinyl aromatic compound is selected from the group consisting of styrene, α -methylstyrene, p-methylstyrene, and vinylnaphthalene.

Claim 12 (Currently Amended): The catalytic composition according to ~~any of the previous claims~~ claim 1, wherein the sum of the indexes (x+y+z) in formula (I) is between 2 and 15.

Claim 13 (Currently Amended): The catalytic composition according to ~~any of the previous claims~~ claim 1, wherein "z" in formula (I) is equal to 0.

Claim 14 (Currently Amended): The catalytic composition according to ~~any of the previous claims from 1 to 10~~ claim 1, wherein "x" and "z" in formula (I) are both equal to 0 and said group R' consists of an oligomer of a conjugated diene D having an average polymerization degree from 2 to 15.

Claim 15 (Currently Amended): The catalytic composition according to ~~any of the previous claims~~ claim 1, wherein said group R¹ in formula (I) represents an aliphatic, cycloaliphatic, aromatic or alkyl aromatic group having from 2 to 10 carbon atoms, preferably selected from ~~tert butyl, isopropyl, n-hexyl, cyclohexyl, benzyl, phenyl and toluyl.~~

Claim 16 (Currently Amended): The catalytic composition according to ~~any of the previous claims from 5 to 15~~ claim 5, wherein both groups R' and R'', in the complex of formula (II), are independently oligomeric groups of formula (I), ~~preferably having essentially the same formula.~~

Claim 17 (Currently Amended): The catalytic composition according to ~~any of the previous claims from 5 to 16~~ claim 5, wherein said group R₆, in the complex of formula (II),

is ~~"bridged"~~ bridged to said first cyclopentadienyl group, to form, as a whole, a cyclic structure including the metal M.

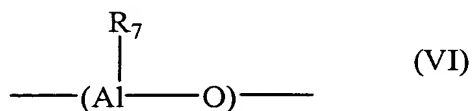
Claim 18 (Currently Amended): The catalytic composition according to ~~any of the previous claims from 5 to 16~~ claim 5, wherein said group R₆, in the complex of formula (II), represents a second cyclopentadienyl group η^5 -coordinated to the metal M.

Claim 19 (Original): The catalytic composition according to claim 18, wherein said first and second cyclopentadienyl group are equal to each other.

Claim 20 (Currently Amended): The catalytic composition according to ~~any of the previous claims from 5 to 16~~ claim 5, wherein said complex of formula (II) includes three oligomeric groups of formula (I), in addition to said first η -cyclopentadienyl group.

Claim 21 (Currently Amended): The catalytic composition according to ~~any of the previous claims~~ claim 5, wherein said activator (ii) is an oligomeric or polymeric organo-oxygenated compound of aluminum.

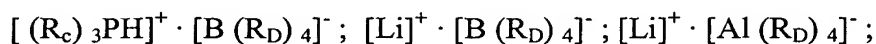
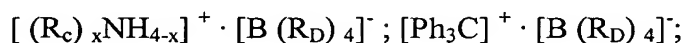
Claim 22 (Currently Amended): The catalytic composition according to claim 21, wherein said activator (ii) is a polymeric aluminoxane including, in each molecule, from 4 to 70 repetition units having the following formula (VI):



wherein R₇ is an alkyl C₁-C₆ group, ~~preferably methyl~~.

Claim 23 (Currently Amended): The catalytic composition according to ~~any of the previous claims from 2 to 20~~ claim 2, wherein said activator (ii) is a compound of type II) ~~consisting of which is~~ an ionic organometallic compound of a metal M' selected from the group consisting of boron, aluminum or and gallium, preferably boron.

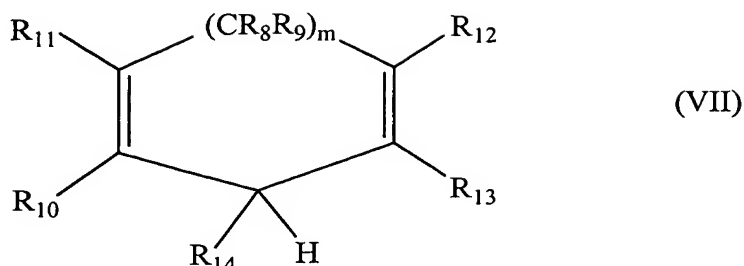
Claim 24 (Currently Amended): The catalytic composition according to claim 23, wherein said activator (ii) is a compound or a mixture of compounds having one of the following general formulae:



wherein the subscript "x" is an integer between 0 and 3, each R_c group independently represents an alkyl or aryl radical with from 1 to 10 carbon atoms, and each R_D group independently represents a an at least partially ~~or, preferably, a totally~~ fluorinated aryl radical having from 6 to 20 carbon atoms.

Claim 25 (Currently Amended): The catalytic composition according to ~~any of the previous claims from 1 to 20~~ claim 1, wherein said ionizing activator (ii) is a strong Lewis acid, ~~preferably selected from triaryl boranes.~~

Claim 26 (Currently Amended): The catalytic composition according to ~~any of the previous claims from 1 to 20~~ claim 1, wherein said ionizing activator (ii) includes at least one fluorinated organic compound having the following formula (VII):



wherein:

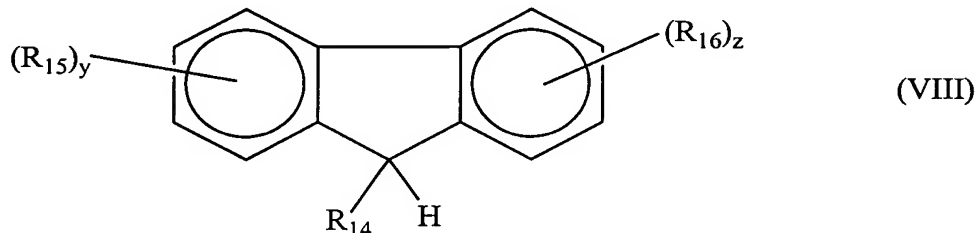
- each R_i (where "i" is an integer from 10 to 14), R_8 and R_9 group is a substituent of the di-unsaturated cycle independently selected from the group consisting of hydrogen, fluorine, ~~and~~ an optionally fluorinated aliphatic hydrocarbyl group, and an optionally fluorinated ~~or~~ aromatic hydrocarbyl group, ~~fluorinated or non-fluorinated~~, having from 1 to 20 carbon atoms, optionally bonded to a different hydrocarbyl R_i group adjacent thereto, to form a further condensed cycle with said di-unsaturated cycle,
- on the condition that at least three, ~~preferably at least four~~, of the R_8 , R_9 , R_{10} , R_{11} , R_{12} , ~~or~~ and R_{13} , groups, are independently selected, from the group (a) consisting of:
 - fluorine, ~~or~~
 - a fluorinated alkyl group having the formula $-CF(R'_1R'_2)$, ~~or~~
 - a fluorinated aryl group Ar_F , substituted on the aromatic ring, with at least two groups selected from the group consisting of fluorine, a $-CF(R'_1R'_2)$ group as defined above, ~~or~~ and a different Ar_F group, ~~or~~ and
 - a fluorinated vinyl group V_F , substituted on at least two positions of the double bond with groups selected from the group consisting of fluorine, a $-CF(R'_1R'_2)$ group ~~or~~ and an Ar_F group, as defined above;

wherein each R'_1 or R'_2 can have any of the above meanings of the R_i groups, and at least one of them is fluorine or fluorinated alkyl at least in position 1, or a fluorinated aryl Ar_F as defined above, or a fluorinated vinyl group V_F as defined above; and

- "m" can have the value of 1 or 0.

Claim 27 (Original): The catalytic composition according to claim 26, wherein "m" in said fluorinated organic compound of formula (VII) is equal to 0.

Claim 28 (Currently Amended): The catalytic composition according to ~~claims 26 or 27~~ claim 26, wherein said compound of formula (VII) is a fluorinated fluorenyl compound having the following formula (VIII):



wherein:

- R_{14} has the same meaning defined for the compounds of formula (VII);
- (y) is an integer from 1 to 4;
- (z) is an integer from 1 to 4;
- the groups R_{15} and R_{16} are, ~~if necessary,~~ independently substituents of each hydrogen atom of the respective aromatic ring in one or more of the four positions available, and are selected from the group consisting of fluorine, or an optionally fluorinated aliphatic hydrocarbyl group, and an optionally fluorinated

~~or~~ aromatic hydrocarbyl group, ~~fluorinated or non-fluorinated~~, having from 1 to 20 carbon atoms, optionally bonded to a different R₁₅ or, R₁₆ hydrocarbyl group, respectively, to form a further cycle,

on the condition that at least 3, ~~preferably at least 4~~ of said ~~[[R₄]]~~ R₁₄, R₁₅ and R₁₆ groups are independently selected from the group (b) consisting of:

- fluorine, ~~or~~
- a fluorinated alkyl group having the formula -CF(R'₁R'₂), wherein each R'₁ or R'₂ group can have any of the above meanings of the R_i groups and at least one of these is fluorine, or fluorinated alkyl at least in position 1, or a fluorinated alkyl Ar_F as defined below, or a fluorinated vinyl group V_F as defined below, ~~or~~
- a fluorinated aryl group Ar_F, substituted on the aromatic ring, with at least two groups selected from the group consisting of fluorine, a -CF(R'₁R'₂) group as defined above, ~~or~~ and a different Ar_F group, ~~or~~ and
- a fluorinated vinyl group V_F, substituted on at least two positions of the double bond with groups selected from the group consisting of fluorine, a -CF(R'₁R'₂) group ~~or~~ and an Ar_F group, as defined above.

Claim 29 (Currently Amended): The catalytic composition according to ~~any of the previous claims from 26 to 28~~ claim 26, wherein said fluorinated organic compound having formula (VII) ~~or (VIII)~~ in said activator (ii), is added to the catalytic composition in a molar ratio between 1 and 10, with respect to the moles of the metallocene complex (i).

Claim 30 (Currently Amended): A process ~~for the~~ comprising (co) polymerization of at least one α -olefin, ~~characterized in that said α -olefin is (co) polymerized, under suitable~~

~~polymerization conditions~~, in the presence of a catalytic composition comprising the following two components in contact with each other, or the product of their reaction:

- (i) a metallocene complex of a metal M of group 4 of the periodic table, including at least one η^5 -cyclopentadienyl group and at least one unsaturated hydrocarbyl group R', bonded to the metal M;
- (ii) an ionizing activator ~~consisting of~~ which is at least one organic or organometallic compound capable of reacting with said metallocene complex (i) so as to form a positive ionic charge thereon by the extraction of an anion of an unsaturated hydrocarbylic organic group and formation of a non-coordinating anion with a delocalized ionic charge;

~~characterized in that~~ wherein said unsaturated hydrocarbyl group R' has the following formula (I):



wherein:

- A represents any monomeric unit ~~deriving~~ derived from a vinylaromatic group polymerizable by means of anionic polymerization, having from 6 to 20 carbon atoms;
- D represents any monomeric unit ~~deriving~~ derived from a conjugated diolefin polymerizable by means of anionic polymerization, having from 4 to 20 carbon atoms;
- U represents any generic ~~optional~~ monomeric unit ~~deriving~~ derived from an unsaturated compound copolymerizable with any of the above conjugated diolefins D or vinylaromatic compounds A;
- R^I represents hydrogen or a hydrocarbyl group having from 1 to 20 carbon atoms,

- each index "x" and "y" can be independently zero or an integer, provided the sum (x+y) is equal to or higher than 2;
- the index "z" can be zero or an integer ranging from 1 to 20.

Claim 31 (Currently Amended): ~~The process according to claim 30, wherein said catalytic composition is a composition according to one of the previous claims from 1 to 29~~ A process comprising (co) polymerization of at least one α -olefin, in the presence of a catalytic composition comprising the following two components in contact with each other, or the product of their reaction:

- (i) a metallocene complex of a metal M of group 4 of the periodic table, including at least one η^5 -cyclopentadienyl group and at least one unsaturated hydrocarbyl group R', bonded to the metal M;
- (ii) an ionizing activator which is at least one organic or organometallic compound capable of reacting with said metallocene complex (i) so as to form a positive ionic charge thereon by the extraction of an anion of an unsaturated hydrocarbylic organic group and formation of a non-coordinating anion with a delocalized ionic charge;

wherein said unsaturated hydrocarbyl group R' has the following formula (I):



wherein:

- A represents any monomeric unit derived from a vinylaromatic group polymerizable by means of anionic polymerization, having from 6 to 20 carbon atoms;

- D represents any monomeric unit derived from a conjugated diolefin polymerizable by means of anionic polymerization, having from 4 to 20 carbon atoms;
- U represents any generic monomeric unit derived from an unsaturated compound co-polymerizable with any of the above conjugated diolefins D or vinylaromatic compounds A;
- R¹ represents hydrogen or a hydrocarbyl group having from 1 to 20 carbon atoms;
- the index "x" can be zero or an integer;
- the index "y" is an integer higher than zero;
- the index "z" can be zero or an integer ranging from 1 to 20; and
- the sum (x+y) is equal to or higher than 2.

Claim 32 (Currently Amended): The process according to ~~either claims 30 and 31~~ claim 30, wherein said α -olefin is (co)polymerized ~~both in either continuous and or~~ batchwise, in one or more steps, in ~~suitable~~ reactors, at low (0.1-1.0 MPa), medium (1.0-10 MPa) or high (10-150 MPa) pressure, at temperatures between 20 and 240°C, optionally in the presence of an inert diluent.

Claim 33 (Currently Amended): The process according to ~~any of the previous claims from 30 to 32~~ claim 30, ~~characterized in that~~ wherein it is carried out in solution or suspension, in ~~a suitable~~ an inert medium consisting of an aliphatic or cycloaliphatic hydrocarbon having from 3 to 15 carbon atoms, or a mixture thereof.

Claim 34 (Currently Amended): The process according to ~~any of the claims from 30 to 32~~ claim 30, wherein said α -olefin is polymerized in gas phase, at pressures ranging from 0.5 to 5 MPa and temperatures ranging from 50 to 150°C, and said catalytic composition comprises at least one of the components (i) or (ii) on an inert solid carrier.

Claim 35 (Currently Amended): The process according to ~~any of the claims from 30 to 34~~ claim 30, ~~for the (co)polymerization of~~ wherein the at least one α -olefin comprises ethylene.

Claim 36 (Currently Amended): The process according to claim 35, wherein ethylene is copolymerized with at least a second α -olefin having from 3 to 10 carbon ~~atoms~~, atoms.

Claim 37 (Original): The process according to claim 36, wherein, in addition to said second α -olefin, a non-conjugated, aliphatic or alicyclic diene, having from 5 to 20 carbon atoms is copolymerized with ethylene.

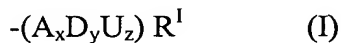
Claim 38 (Currently Amended): The process according to ~~any of the previous claims from 30 to 37~~ claim 30, wherein said catalytic composition is prepared separately and subsequently put in contact with said at least one α -olefin.

Claim 39 (Currently Amended): The process according ~~any of the previous claims from 30 to 37~~ to claim 30, wherein said catalytic composition is prepared by putting said components (i) and (ii) in contact with each other, ~~in the appropriate proportions~~, directly in the polymerization medium.

Claim 40 (Currently Amended): The process according to ~~any of the previous claims from 30 to 38~~ claim 30, ~~for the production of~~ wherein linear high, medium and or low density polyethylene is produced by said (co)polymerization.

Claim 41 (Currently Amended): A catalytic composition for the (co) polymerization of ethylene and other α -olefins, comprising the following two components in contact with each other, or the product of their reaction:

- (i) a metallocene complex of a metal M of group 4 of the periodic table, including at least one η^5 -cyclopentadienyl group and at least one unsaturated hydrocarbyl group R', bonded to the metal M;
- (ii) an ionizing activator ~~consisting of~~ which is at least one organic or organometallic compound capable of reacting with said metallocene complex (i) so as to form a positive ionic charge thereon by the ex-traction of an anion of an unsaturated hydrocarbylic organic group and formation of a non-coordinating anion with a delocalized ionic charge, selected from the group consisting of the following classes of compounds:
 - I) non-coordinating ionic organometallic compounds;
 - II) non-coordinating Lewis acids, and
 - III) polyfluorinated cyclopentadienyl ~~compounds~~, compounds, ~~characterized in that~~ wherein said unsaturated hydrocarbyl group R' has the following formula (I):



wherein:

- A represents any monomeric unit ~~deriving~~ derived from a vinylaromatic group polymerizable by means of anionic polymerization, having from 6 to 20 carbon atoms;
- D represents any monomeric unit ~~deriving~~ derived from a conjugated diolefin polymerizable by means of anionic polymerization, having from 4 to 20 carbon atoms;
- U represents any generic ~~optional~~ monomeric unit ~~deriving~~ derived from an unsaturated compound copolymerizable with any of the above conjugated diolefins D or vinylaromatic compounds A;
- R¹ represents hydrogen or a hydrocarbyl group having from 1 to 20 carbon atoms,
- each index "x" and "y" can be independently zero or an integer, provided the sum (x+y) is equal to or higher than 2;
- the index "z" can be zero or an integer ranging from 1 to 20.

Claim 42 (New): The catalytic composition according to claim 5, wherein M is titanium or zirconium.

Claim 43 (New): The catalytic composition according to claim 15, wherein said group R¹ is selected from the group consisting of tert-butyl, isopropyl, n-hexyl, cyclohexyl, benzyl, phenyl and toluyl.

Claim 44 (New): The catalytic composition according to claim 16, wherein groups R' and R" have essentially the same formula.

Claim 45 (New): The catalytic composition according to claim 22, wherein R₇ is methyl.

Claim 46 (New): The catalytic composition according to claim 23, wherein M' is boron.

Claim 47 (New): The catalytic composition according to claim 24, wherein each R_D group independently represents a totally fluorinated aryl radical having from 6 to 20 carbon atoms.

Claim 48 (New): The catalytic composition according to claim 25, wherein the strong Lewis acid is a triaryl borane.

Claim 49 (New): The catalytic composition according to claim 26, wherein at least four of the R₈, R₉, R₁₀, R₁₁, R₁₂, and R₁₃, groups, are independently selected, from the group (a).

Claim 50 (New): The catalytic composition according to claim 28, wherein at least four of said R₁₄, R₁₅ and R₁₆ groups are independently selected from the group (b).

Claim 51 (New): The catalytic composition according to claim 27, wherein said fluorinated organic compound having formula (VII) in said activator (ii), is added to the catalytic composition in a molar ratio between 1 and 10, with respect to the moles of the metallocene complex (i).

Claim 52 (New): The catalytic composition according to claim 28, wherein said fluorinated organic compound having formula (VIII) in said activator (ii), is added to the catalytic composition in a molar ratio between 1 and 10, with respect to the moles of the metallocene complex (i).

DISCUSSION OF THE AMENDMENT

The claims have been amended by removing all multiple dependency and by incorporating appropriate Markush terminology. In addition, the term "suitable" has been deleted from the claims as redundant, since the claims necessarily exclude non-suitable components, etc. In addition, claim 1 has been amended by replacing "consisting of" with --which is--, and by deleting the word "optional" in the definition of U, since the value for "z" will determine whether this group is present or not. Similarly for Claim 5 and Claim 28 ("if necessary" deleted). See also, with respect to Claim 5, the specification at the paragraph bridging pages 16 and 17 for the amendment to R₁ through R₅, and the paragraph bridging pages 19 and 20 for the amendment to R₆. The definition for R' in Claim 5 has been deleted as redundant. Other amendments have been made to be consistent with the above amendments.

The quotes in Claim 17 have been deleted. Claims 26 and 28 have been amended by inserting --(a)-- and --(b)--, respectively, for a recited Markush group, so as to provide antecedent basis in new Claims 49 and 50, respectively. Claim 28 has been further amended to correct a typographical error. Claim 31 has been amended to be analogous to Claim 30, but to recite the catalytic composition of Claim 1. Claims 35 and 40 have been amended by replacing "for the" with appropriate claim-limiting language.

Narrowing, alternative language has been deleted from Claims 5, 15, 16, 22-26, and 28. The deleted matter is now the subject of new Claims 42-50, respectively. New Claims 51 and 52 are analogous to Claim 29, but depend on Claims 27 and 28, respectively.

No new matter is believed to have been added by the above amendment. Claims 1-52 are now pending in the application.